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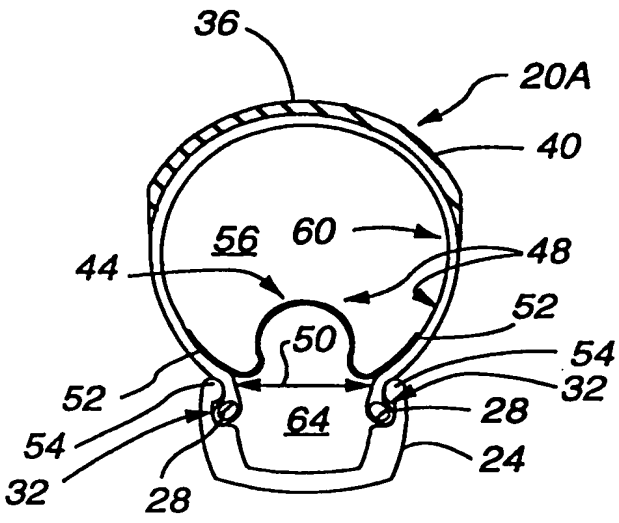
(54) Title: TUBELESS BEADED TIRE WITH SEALING BAND

(57) Abstract

A tubeless beaded tire (20A) is disclosed that can be used on a rim (24) that is not intended for retaining air pressure within a mounted tubeless tire. The tubeless tire (20A) includes a band (44) for closing the gap between the beads (28) of the tire to thereby provide an annular enclosed portion (56) of the tire that functions in a manner similar to an inner tube. That is, the band (44) is configured such that, upon tire inflation, the band (44) enters into the rim (24) to secure the beads (28) of the tire to the rim (24). Further, the band (44) may have a bias towards the interior (48) of the casing and away from the beads (28) so that when the tire (20A) is uninflated, the band (44) is biased away from the beads (28) for safe mounting and dismounting of the tire (20A) from the rim (24) without damaging the band (44).



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TUBELESS BEADED TIRE WITH SEALING BAND

FIELD OF THE INVENTION

The present invention relates to tubeless tires, and in particular, to tubeless tires that have a sealed interior so that such tires can be used with tire rims not intended for tubeless tires.

BACKGROUND OF THE INVENTION

Beaded tires have typically had tire casings with an open, horseshoe-shaped cross section with tire beads being at the free ends of the horseshoe shaped cross section such that the beads are capable of being seated into recesses within flanges of a tire rim. That is, the tire beads extend continuously around the inner circular extent of the tire casing. Such beaded tires may require an inner tube for retaining air pressure therein. This is particularly true when the tire rims are not sealed to prevent air leaks through the rim. Typical bicycle rims, for example, are not capable of retaining air pressure within a mounted tire since such air pressure is able to leak through, for example, spoke holes. Thus, inner tubes are used within most beaded bicycle tires for retaining air pressure within the inflated tire. This configuration has a number of drawbacks, some of these being: (a) the inner tubes are subject to puncturing or pinching when the tire hits an object and folds sufficiently so that the tube is pinched or squeezed between the rim and the object hit, thereby rupturing the inner tube; (b) careful techniques are required to mount and/or dismount a tire and inner tube from a rim due to the need to maintain the inner tube within the interior of the tire casing in order to avoid damage to the inner tube ; and (c) opportunity for grit or other unwanted matter to become lodged between the inner tube and tire that can cause a puncture.

Therefore , in accordance with the present invention; it would be advantageous to have beaded bicycle tires that are also tubeless, wherein (a) such tires can be mounted and/or dismounted on conventional tire rims typically requiring inner tubes; (b) such tires are less susceptible to the pinching type of flats mentioned above; and (c) such tires can be mounted onto and dismounted from tire rims easier and safer.

SUMMARY OF THE INVENTION

The present invention is a novel tubeless tire that can be fitted onto, for example, rims that are not designed to be used with tubeless tires. In particular, the tires of the present invention can be mounted and effectively inflated on tire rims that are not sufficiently sealed for retaining air pressure within the interior of the tire. Such leaky rims may be, for example, rims with spokes, wherein the spoke holes pierce the interior of the rim in an area that would typically require sealing for tubeless tires. The tire of the present invention can be used with such leaky rims without the use of a separate inner tube within the tire casing. In that regard, the tire of the present invention includes a band of low-permeability material that extends between the beads of the tire that sealingly provides a built in, inner tube-like air retaining area within the tire casing itself for sealing the typically open gap between the tire beads. More particularly, the present invention provides an air enclosure within the tire, wherein the band is constructed so that upon inflation of the tire, the band extends into the rim in a manner that is effective for retaining the tire beads within their seated positions on the tire rim. Further, the band of the tire is sufficiently wide so that the band can be folded or tucked into the tire casing away from the beads when the tire is not inflated so that the

band is not damaged during mounting and/or dismounting of the tire onto the rim.

In one embodiment of the tire for the present invention, the band enclosing the interior of the tire has a bias formed within it so that when the tire is uninflated, the band has a preference to retreat away from the beads of the tire and into the interior of the tire. Thus, during the mounting and/or dismounting of the tire from a rim, the band is unlikely to be damaged by tire changing tools, and further, the band is unlikely to be misaligned or become pinched between the tire casing and the rim.

In one embodiment of the present invention, the band is bonded to the interior sides of the tire casing at a sufficient distance from the tire beads so that the band and the areas where the band is sealed to the interior of the tire casing are substantially out of the way when tire changing tools are used and stress is applied to the tire during a mounting or dismounting process.

In an alternative embodiment, the band may be provided in a manner wherein it attaches substantially at the tire beads. In this embodiment, the band may have enhanced durability characteristics for those portions of the band near or surrounding the tire beads. In particular, such enhanced durability portions of the band may be extensions of the tire casing such that these extensions are able to be sealed together to form the band between the tire beads.

Other features and benefits of the present invention will become apparent from the detailed description and the accompanying drawings contained herein.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an illustration of an embodiment of the tire of the present invention, wherein the tire is mounted to a conventional bicycle rim and the tire is uninflated.

Fig. 2 shows a tire of the present invention in an unmounted state and having a portion thereof cut away for thereby showing an internal structure of the tire.

Fig. 3 is another illustration of the tire shown in Figs. 1 and 2, wherein the tire is inflated upon the rim so that the elastic band 44 extends into the rim chamber 64 and thereby allows air pressure within the tire to be used for retaining the tire beads 28 within their rim recesses 32.

Fig. 4 illustrates an alternative embodiment of the present invention, wherein that band 44 does not have sufficient elasticity to entirely conform to the internal contours of the rim 24. In particular, the band 44 may be provided from a non-stretchy band material, such as a rubberized fabric.

Figs. 5A and 5B provide another embodiment of the present invention, wherein the band 44 includes a mechanical closure, such as a bead-in-groove zipper, for providing a seal between band portions 44a and 44b that can be mated together via the zipper.

Figs. 6A and 6B illustrate another alternative embodiment of the present invention, wherein the band is attached to the tire casing substantially at or about the tire beads 28.

Fig. 7 shows the embodiment of Fig. 6 when the tire is fully inflated.

DETAILED DESCRIPTION

Figure 1 illustrates a cross section of a tire 20A of the present invention mounted to a conventional bicycle rim 24 wherein this rim is intended to be used with a combination of bicycle tire and inner tube. In particular, the bicycle tire 20A of the present invention is mounted on bicycle rim 24 so that tire beads 28 are seated within rim recesses 32. Moreover, the road or ground contacting

portion of the tire 20A is tire surface 36 of the tire treaded portion 40. Tire 20A includes a band 44 that is bonded onto the interior surface 48 of the tire at bonded areas 52. The band 44 and the bonded areas 52 seal the gap between the beads 28 and thereby cause an interior portion 56 to be fully enclosed. Note that the tire 20A is shown in perspective in Fig. 2 (with a section of the tire removed for illustration), wherein the tire 20A is removed from the rim 24.

The band 44, the bonded areas 52 and the interior surfaces 48 of the interior portion 56 provide an airtight seal for the interior portion 56 of the tire 20A. In one embodiment, the interior surface 48 and the band 44 include a low permeability material (i.e., an elastomer) that is effective in preventing pressurized air from escaping the interior portion 56. For example, with respect to the interior surface 48, there is an inner layer 60 that coats the interior of the tire 20A to provide the interior surface 48 for preventing pressurized air from leaking through the casing. Additionally, note that the width of the band 44 extending across the gap 50 between the beads 28 is wider than the distance between the beads. In particular, the band 44 is wide enough so that when the interior portion 56 is provided with typical amounts of air pressure for inflating the tire 20A, band 44 expands into the rim chamber 64 as shown in Fig. 3.

Additionally, referring again to Fig. 1, note that in the non-inflated state shown in this figure, although the band 44 is wider than the gap 50, the band is not so wide as to allow folds in the band when it is forced into the rim chamber 64 by tire pressure. However, the band 44 is provided in a manner so that it can be folded or tucked into the interior of the tire 20A and away from the beads 28 so that there is sufficient space between the beads 28 and the band 44 to allow for mounting and dismounting of

the tire 20A from the rim 24 with slight risk of puncturing the band with, for example, tire changing tools. Accordingly, the band 44 of the present figure (Fig. 1) may have a maximum band width between the bonded areas 52 of approximately the distance between the free ends of the rim flanges 54, plus twice the height 68 (Fig. 3). A minimum band width may also be defined and it depends on whether the band is elastic or inelastic. For an elastic band, the minimum band width is such that, when stretched fully into the rim chamber, it does not exceed its elasticity. For a non-elastic band, the minimum band width is such that it does not pull inwardly on the beads and interfere with the seating force.

In one preferred embodiment, the band 44 is manufactured with a preferred bias for receding into the interior of the tire 20A and away from the beads 28 as shown in Fig. 1. Thus, in mounting or dismounting the tire 20A, the band will tend to recede away from the beads 28 and thus the band will be protected from damage during a tire change. Further note that in the embodiment of Fig. 1, the bonded areas 52 are offset toward the interior of the tire 20A and away from the beads thereby adding an additional measure of protection against damaging the band when mounting and/or dismounting the tire 20A.

The tire 20A represented in Figs. 1 through 3 includes a band 44 that is sufficiently elastic so that when the tire is inflated, the air pressure within interior portion 56 will cause the band to conform to the interior rim chamber 64. However, the band 44 need not have this amount of elasticity, as mentioned above. An example of an inflated tire 20B according to the present invention that has a substantially non-elastic band 44 is shown in Fig. 4. In particular, note that the band 44 does not fully conform to the interior contours of the rim chamber when the tire 20B is inflated. However, note that an essential aspect of

the present invention is that the band 44 must have sufficient width so that the band will form around and contact the rim below the beads far enough so that the tension in the band does not pull on the beads in a direction substantially away from the recess 32.

In Figs. 5A and 5B, an alternative embodiment of the present invention is illustrated wherein the tire 20C shown in these figures includes a band 44 that is the combination of two separate band pieces 44a and 44b that can be, for example, mechanically mated together by a bead-in-groove type zipper 72 in the middle of the resulting band 44. Note that an advantage of providing the band 44 as two separate mating pieces is that the tire 20C may be easier to fabricate and/or repair. That is, the zipper 72 can provide an easy method for both sealing the interior portion 56 and to also gaining access thereto. Additionally, providing such a zipper configuration may facilitate the insertion and removal of tire sealants which would otherwise normally be inserted and removed through a valve stem of a typical tire tube. Further, in a related embodiment of the present invention, such a zipper (or, more generally, a mechanical closure mechanism) within the band may be provided only around a valve stem base such as found in valves referred to "bolted-on" valves for those skilled in the art. Additionally, note that such band mechanical closures can be off-center of the band 44 so that the width of the band portions 44a and 44b are unequal. In a related variant, more than one zipper could be employed, such as one zipper could be utilized near the bead on each side of the rim 24.

Figs. 6A and 6B illustrate another embodiment of the tire of the present invention (labeled 20D). In this embodiment, the band 44 is attached substantially at or near the beads 28. Accordingly, the portions of the band 44 attached about the beads 28 include a toughened material

that can withstand the stress induced by tire changing tools, and can withstand being forcibly urged over the rim flanges 54. However, the central section of the band 44 need not be as resistant to tire changing stresses in that it can be folded or curved so that it is inwardly directed into the interior of the tire 20D and away from the beads 28. Thus, assuming at least the central portion of the band 44 is elastic, Fig. 7 shows the tire embodiment 20D of Figs. 6 fully inflated wherein the band 44 conforms to the rim chamber 64.

Embodiments of the present invention may be manufactured in a number of ways. For example, in providing the low permeability tire inner layer 60 that is common to each embodiment shown of the present invention, a conventional inner tube can be bonded to the interior surface of the tire, thereby forming the inner layer 60. Further, if the bonded inner tube has a diameter larger than the interior tire width 80 (Fig. 2), then the excess inner tube material not bonded to the tire can provide an effective embodiment of the band 44 if this excess amount of inner tube is sufficient for allowing the band to effectively folded within the interior of the tire during mounting and dismounting. Moreover, in manufacturing the embodiment of Figs. 6 and 7, the band 44 may be formed as an extension of the casing materials from which the tire itself is formed. Alternatively, note that the band 44 in Fig. 6 can be bonded onto the tire portion substantially surrounding the beads 28 as, for example, shown in Figs. 6A and 6B.

The foregoing discussion of the invention has been presented for purposes of illustration and description. Further, the description is not intended to limit the invention to the form disclosed herein. Consequently, variation and modification commensurate with the above teachings, within the skill and knowledge of the relevant

art, are within the scope of the present invention. The embodiment described hereinabove is further intended to explain the best mode presently known of practicing the invention and to enable others skilled in the art to utilize the invention as such, or in other embodiments, and with the various modifications required by their particular application or uses of the invention. It is intended that the appended claims be construed to include alternative embodiments to the extent permitted by the prior art.

What is claimed is:

1. A tire comprising:

first and second beaded portions for attaching the tire to a bicycle rim, wherein the first beaded portion contacts a first rim flange and the second beaded portion contacts a second rim flange, the first and second rim flanges being on opposed sides of a circumference of the rim;

a tire casing portion having an inner surface and an outer surface, said tire casing portion connected to the first and second beads and extending outwardly from the rim circumference for riding upon said outer surface, wherein said inner surface defines an interior having an opening to a portion of the rim substantially between said beaded portions;

a band attached to one of said beaded portion and said tire casing for sealing said opening so that air pressure is capable of being retained in a volume bounded by said inner surface and said band, wherein said band: (a) expands to a contour of said rim when said tire is inflated, and (b) is capable of being confined within said interior when said tire is deflated so that said band is inhibited from being damaged during one of mounting and removal of said tire from the rim.

2. A tire as claimed in Claim 1, wherein said band has a preference to retreat into said interior when said tire is deflated.

3. A tire as claimed in Claim 1, wherein said band includes an excess of band material between said first and second beaded portions so that said excess band material allows for said band to expand and retreat.

4. A tire as claimed in Claim 1, wherein said band includes an elastomeric material so that said band substantially conforms to an interior of said rim when said tire is inflated.

5. A tire as claimed in Claim 1, wherein said band overlaps both of said first and second bead portions when said tire is inflated.

6. A tire as claimed in Claim 1, wherein said band includes a low permeability material for retaining air pressure when said tire is inflated.

7. A tire as claimed in Claim 1, wherein said band includes a resealable seam for providing access to said interior.

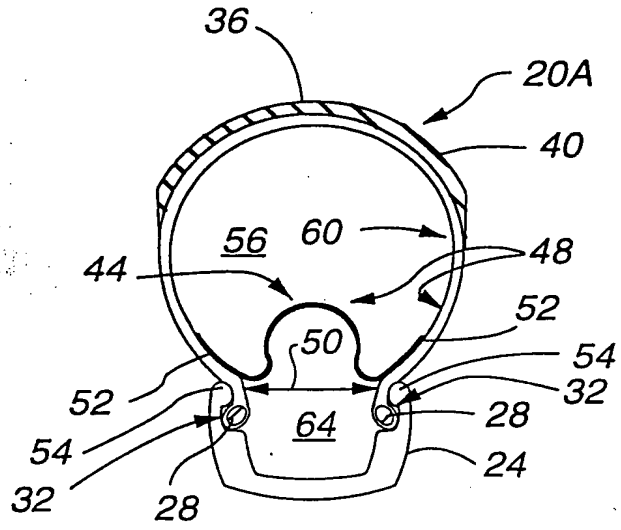

FIG. 1

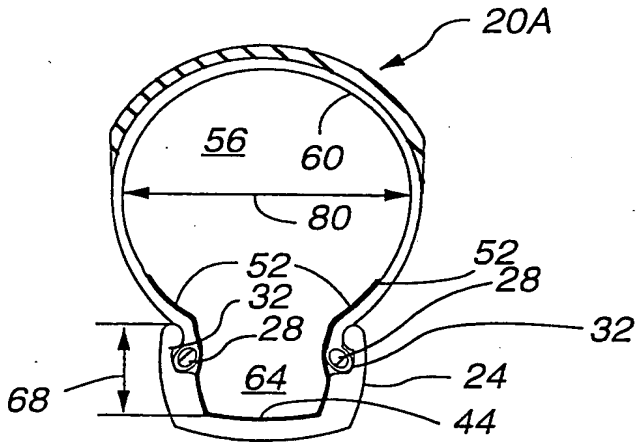

FIG. 3

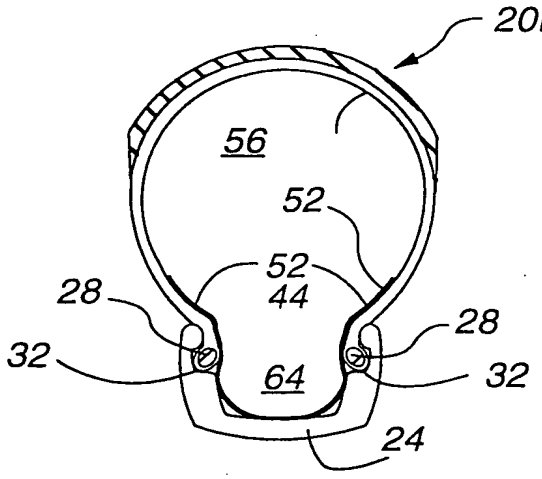

FIG. 4

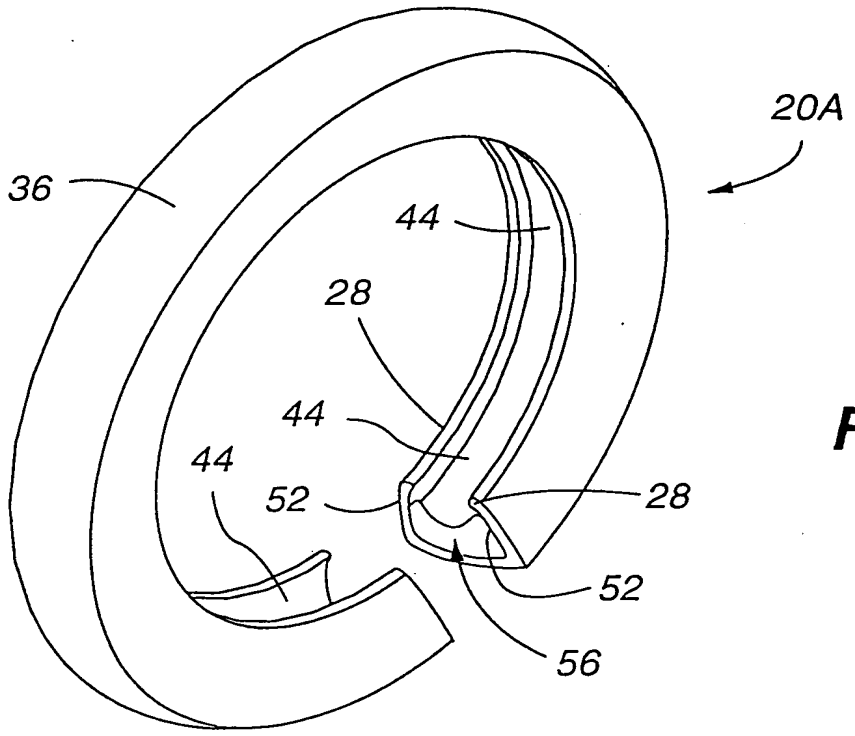

Fig. 2

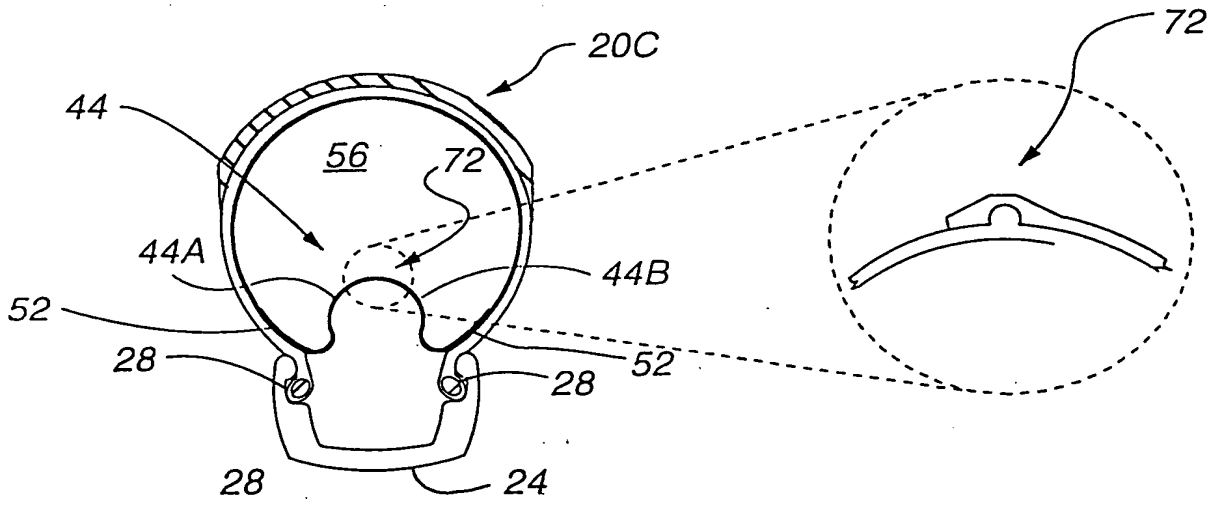

Fig. 5B

FIG. 5A

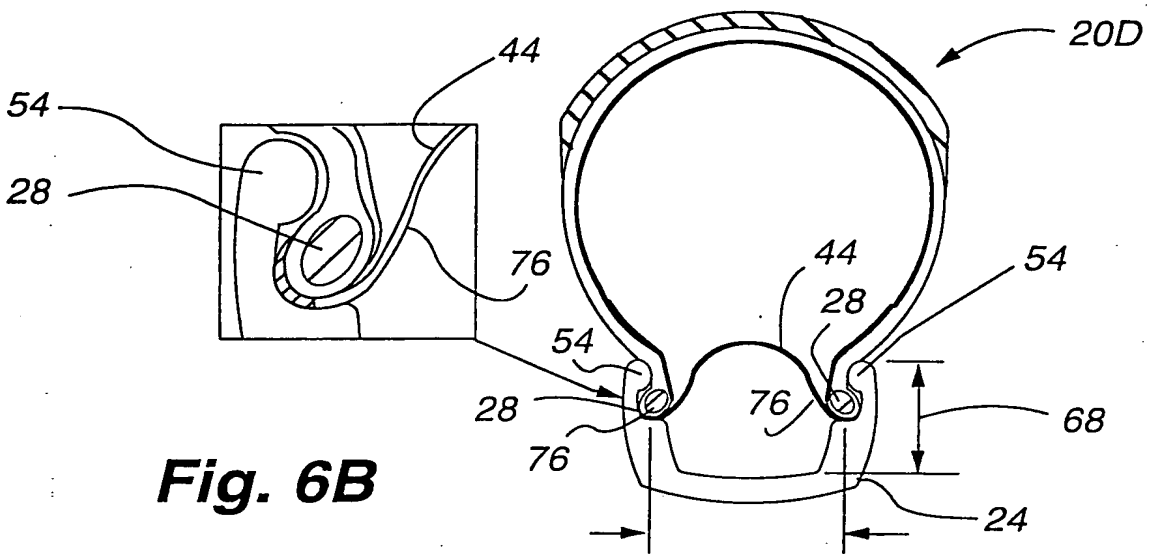

Fig. 6B

Fig. 6A

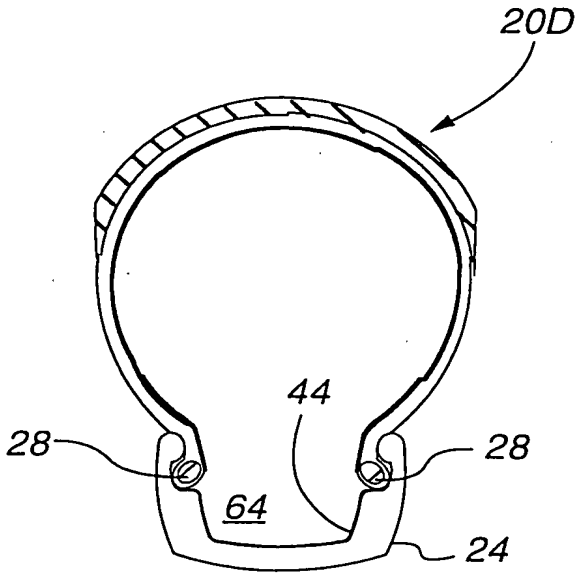

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :B60C 5/12, 5/16, 19/00, 19/04
US CL :152/513, 514, 515
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	DE 1024384 B (F.W. HEUSINKVELD) 13 February 1958, entire document.	1-6 ----- 7
X -- Y	JP 7-101202 A (S. SAIDA) 18 April 1995, entire document.	1-6 ----- 7
Y	US 971,301 A (MOORE) 27 September 1910, entire document.	7
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